

Remarks/Arguments

Claims 1-13 are pending in this Application. By this Amendment, claims 1-12 are amended. No new matter is added. Support for the various amendments can be found in the previously presented claims, Figures 5 and 6 and the Detail Description section of the Specification. Reconsideration in view of the above amendments and the following remarks is respectfully solicited.

Claims 1-4 are Directed to Patentable Subject Matter

The Office Action rejects claim 1-4 under 35 U.S.C. §102(b) over Nakasuji et al (U.S. Patent No. 6,162,581); rejects claim 1 under 35 U.S.C. §102(b) over Yamaguchi et al (U.S. Patent No. 5,894,057) and rejects claims 1-3 under 35 U.S.C. §102(b) over Okino (U.S. Patent No. 6,258,511). These rejections are respectfully traversed.

In particular, Applicants assert that none of the applied art of record teaches or suggests an electron beam lithography method having extending widths of a plurality of stripes which divide a region where an electron beam exposure is to be performed, so that the stripes overlap adjacent stripes at boundaries between the stripes ... wherein the scan dose of the electron beam for the extended region of a stripe is reduced in a stepwise manner toward an adjacent stripe and has at least two intermediate steps between the electron beam for a non-extended region of the stripe and a zero scan dose, as is recited in independent claim 1.

Okino discloses a method for charged particle exposure that includes dividing a pattern into subfields with each subfield having a striped shape. See, Abstract. As is stated

by the Office Action, Okino's exposure method includes "*forming the subfields (41L) and (41R) laid around the boundary in the adjacent stripes (49L) and (49R), and exposing the subfields (41L) and (41R) by half the exposure time amount.*" See, page 5 of the Office Action and col. 6, lines 35-43 of Okino. Further, as is mentioned on col. 6, lines 40-41 of Okino, "*the subfield 41L and the subfield 41R are exposed at the same position on the wafer.*" However, Okino does not disclose or suggest any stripe reduced in a stepwise manner toward an adjacent stripe and having least two intermediate steps between the electron beam for a non-extended region of the stripe and a zero scan dose, as recited in independent claim 1.

To the contrary, as shown in Figure 3 in Okino, while adjacent stripes (149), (149L) and (149R) can overlap, at most each strip (149), (149L) and (149R) can have a single reduction of a half dose and only around specific regions (141D). Because of this, portions of a substrate processed according to Okino's description can have as much as a $\pm 50\%$ variation of implantation, whereas the solution proffered by the claimed methods and systems can reduce this error from $\pm 25\%$ when three intermediate steps are used to as little as a few percent when more intermediate steps are used. Thus, Okino does not teach or suggest each and every limitation of independent claim 1.

Nakasuji discloses a charged particle beam pattern transfer method that uses a non-uniform dose distribution. See, Abstract. As shown in Figures 4 and 6, various stripes 82 can have central regions 83 receiving a full dose of charged particles surrounded by edges 80 having a linearly-sloped profile, which according to Nakasuji is derived via the use of a "beam vibration deflector" 6 (shown in Figure 1). Nakasuji does not disclose or

suggest any stripe reduced in a stepwise manner toward an adjacent stripe and having least two intermediate steps between the electron beam for a non-extended region of the stripe and a zero scan dose, as recited in independent claim 1.

To the contrary, the above-described overlapping edge regions of Nakasuji are strictly limited to linearly-sloping regions that requires a special vibrating beam deflecting device to operate, and the nature of Nakasuji's beam vibration deflector 6 does not lend itself to stepped profiles.

While Nakasuji does disclose separate connection ends 64a-64d that can be subjected to about 50% exposure in certain circumstances (see, col. 9, lines 4-12 and Figure 2) these connection ends 64a-64d can amount to at most a single dose step, and thus these connection ends 64a-64d are subject to the same large $\pm 50\%$ variation as seen with Okino. Accordingly, Nakasuji does not provide for the deficiencies of Okino.

Yamaguchi discloses a charged beam drawing method that operates by overlapping a series of stripes. See, Figure 3 and its supporting text. Yamaguchi does not disclose or suggest that any stripe be reduced in a stepwise manner toward an adjacent stripe and having least two intermediate steps between the electron beam for a non-extended region of the stripe and a zero scan dose, as is recited in independent claim 1, nor does the Office Action assert such. Thus, Yamaguchi does not provide for the deficiencies of Okino and Nakasuji.

Thus, claim 1 defines patentable subject matter. Dependent claims 2-4 define patentable subject matter by virtue of their dependency as well as for the additional features they recite. Accordingly, withdrawal of the rejections of claims 1-4 is respectfully

solicited.

Claims 5-13 are Directed to Patentable Subject Matter

The Office Action rejects claim 5 and 9 under 35 U.S.C. §102(b) over Yamaguchi; and further rejects claims 5-13 under 35 U.S.C. §103 over Nakasuji in view of Yamaguchi. These rejections are respectfully traversed.

In particular, Applicants assert that it would not have been obvious at the time of the invention to modify Nakasuji using the teachings of Yamaguchi to teach or suggest an electron beam lithography method that includes performing a first electron beam exposure ... wherein the scan dose of the electron beam for the extended region of a stripe is reduced in a stepwise manner toward an adjacent stripe, and sequentially performing a second electron beam exposure by extending the width of a second stripe of a plurality of second stripes which divide the region where the electron beam exposure is to be performed, wherein the extended regions of the first and second beam exposures are staggered such that the extended region of the first exposure falls within the non-extended region of the second exposure, as recited in independent claim 5 and similarly recited in independent claim 9.

Yamaguchi discloses the methods and systems discussed above. Yamaguchi does not teach or suggest the use of multiple, overlapping exposures of stripes onto a substrate where each stripe has an extended region that is reduced in a stepwise manner toward an adjacent stripe, nor does the Office Action assert such. Thus, Yamaguchi does not teach or suggest each and every limitation of as they are currently written, and thus Yamaguchi does

not anticipate as they are currently written as they are currently written.

Nakasuji discloses the methods and systems described above. Nakasuji does not teach or suggest the use of multiple, overlapping exposures of stripes onto a substrate where each stripe has an extended region that is reduced in a stepwise manner toward an adjacent stripe, an issue that the Office Action correctly concedes on page 7.

The Office Action has not established a *prima facie* case of obviousness under 35 U.S.C. § 103(a). To establish a *prima facie* case of obviousness, the prior art references must disclose or suggest all the claim limitations, and there must be some motivation either in the references themselves or in the knowledge generally available to one of ordinary skill in the art to modify or combine the reference teachings. See M.P.E.P. § 2143.

As discussed above, none of the references discloses, suggests or even appreciates the use of multiple, overlapping exposures of stripes onto a substrate where each stripe has an extended region that is reduced in a stepwise manner toward an adjacent stripe, as recited in claims 5 and 9.

Further, the Office Action has not provided the requisite motivation required by 35 U.S.C. §103(a). While the Office Action points out on page 8 that “*it would have been prima facie obvious to one of ordinary skill in the art to move the overlapping regions (stitching areas) as taught by Yamaguichi et al. in the charged particle beam exposure method of Nakasuji et al. with the reasonable expectation of achieving highly useful finished product patterns ... without involving large repetition of subfields and without preparing data in compliance with the number of times for which a pattern is multipassed*”, this assertion is problematic for a number of reasons.

First, the assertion is not supported by any statement within the four corners of any document provided by the Office Action, and the Office Action has not shown how its assertion is within the knowledge of one of ordinary skill in the art.

Second, there's no indication that the application of Nakasuji to the Yamaguichi reference would by any means reduce the number of Yamaguichi's relatively large repetition of subfields.

Third, as both Nakasuji and Yamaguichi are both expected to achieve "*highly useful finished product patterns*", it is not apparent that the Office Action's cited motivation is directed to any combination, but at most a motivation to use either method proposed by Nakasuji and Yamaguichi separately and in an unaltered fashion.

Thus, independent claims 5 and 9 define patentable subject matter. The dependent claims define patentable subject matter by virtue of their dependency as well as for the additional features they recite. Accordingly, withdrawal of the rejections of claims 5-13 is respectfully solicited.

Conclusion

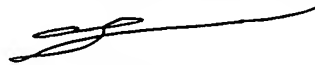
For at least the reasons expounded upon above, it is seen that the prior art does not anticipate or render obvious the subject matter of Applicants' claims. Accordingly, early reconsideration and allowance of the claims are respectfully requested.

In the event that there are any outstanding matters remaining in the present application, please contact Burman York Mathis III (Reg. No. 44,907) at (571) 283-0720 in the Washington, D.C. area, to discuss these matters.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment for any additional fees that may be required, or credit any overpayment, to Deposit Account No. 50-0238.

Respectfully submitted,

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